

PitPro 1.1 User's Manual

Pit-tag to SURPH Data Translation Utility

Technical Manual
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Pit-Tag to SURPH Data Translation Utility

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About This Manual

This manual describes the use of Program PitPro to convert PIT-tag data files in PTAGIS (PIT Tag Information System, Pacific States Marine Fisheries Commission) to input files ready for survival analysis in Program SURPH 2.1. This utility converts the various PIT-tag detections at the multitude of detector coils within a juvenile bypass or at adult counting windows and ladders into capture histories. The capture histories indicate whether a tagged fish was detected, not detected, or detected and censored at the major hydroprojects in the Columbia Basin. A major update to this program is the inclusion of adult upstream detection histories. Adult detection histories include not only whether the fish was detected or not but also the year of detection for proper adult survival estimation.

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1.0 Introduction

The **SURPH** program is a valuable tool for estimating survival and detection probabilities of fish migrating in the Snake and Columbia rivers. Using special input data files, **SURPH** computes reach-to-reach statistics for any release group passing a system of detection sites. However, PIT-tag data, as available from PTAGIS, comes in a form that is not ready for use as **SURPH** input.

SURPH requires a capture history for each fish. A capture history consists of a series of fields, one for each detection site, that has a code for whether the fish was detected and returned to the river, detected and removed, or not detected. The data, as received from PTAGIS, has one line for each detection with information such as fish identification (id), detection date and time, number of coil hits and detector coil ids, etc. Because an individual fish may be detected at several coils within a detection site as well as at several detection sites, each fish is often represented by multiple lines in the PTAGIS data file.

For the PTAGIS data to be usable by **SURPH**, it must be preprocessed. The data must be condensed down to one line per fish with the relevant detection information from the PTAGIS file represented compactly on each line. In addition, the PTAGIS coil information must be passed through a series of logic algorithms to determine whether or not a fish was returned to the river after detection.

Program **PitPro** was developed to allow the user to properly preprocess the PTAGIS data files for input to program **SURPH** through a user friendly graphical user interface (GUI). This utility takes PTAGIS data files as input and creates a **SURPH** data file as well as other output including travel time records, detection date records, and a data error file. **PitPro** allows a user to download PTAGIS files and easily process the data for use with **SURPH**.

Program **PitPro** is based on the command line utility **CaptHist**.

2.0 Obtaining PitPro

To run **PitPro** or **Capthist**, you need a copy of the program. Go to the **SURPH** web page at <http://www.cbr.washington.edu/paramEst/SURPH/> and click on **Utilities for processing PIT tag data from PTAGIS**. This page will have further instructions on obtaining a copy of **PitPro**.

3.0 Motivation

3.1 SURPH Input Files

SURPH input files consist of header information followed by capture histories for each fish in the release group being studied. Below is an example of an abbreviated input file. The file has two basic parts: the header and the data.

-- SURPH file sample ---

```
#
# CaptHist v.PitPro 1.0
#
Surph2
pwlh01
npop 1
nper 4
ntag 100
full_hist
tagID present
captureHistories
222A4E2254 1 1 1 0 0
22294C637A 1 0 0 0 0
22146E624E 1 0 1 0 0
2214670160 1 0 0 1 0
221464261D 1 0 0 0 1
22142A006D 1 0 0 1 0
2214167A3B 1 0 0 1 0
22140C0306 1 0 0 1 1
```

-- end sample --

In the example shown above, fish were released above Lower Granite Dam with potential detections at four downstream locations. The capture history in this example consists of a PIT code followed by 5 fields: the first field for the point of release, the next four fields representing recaptures at Lower Granite, Little Goose, Lower Monumental, and McNary dams. A field can have any one of several values with meanings as follows:

"0" if not detected,

"1" if detected and returned to the river,

"2" if detected and removed from the river, and, optionally,

"U" if detected but of unknown active status.

In addition, there is now an adult/juvenile mode capture history that adds information relevant to adult returns. This is described in more detail in the description of juvenile/adult mode under the [Settings Tab](#) heading.

In the example, we have one population with four periods. The four periods are release to Lower Granite, Lower Granite to Little Goose, Little Goose to Lower Monumental, and Lower Monumental to McNary. The number of fish in this tag group is 100. The fish with PIT code 222A4E2254 was released and then detected at Lower Granite and Little Goose, was known to be in the river after Little Goose but was not detected again. For a further explanation of this data file, see the **SURPH** documentation.

3.2 PTAGIS Data Files

The raw data from PTAGIS that corresponds to the capture history in the previous example is shown in the example below. The columns in order are: tag file id, PIT code, detection site, detection date and time, number of detector coil reads, coil id 1, coil id 2 (XX indicates none), and travel time from release.

To translate this raw data into a **SURPH** data file, we must look at both the detection site code and the coil ids, as well as the detection date. The detection site code will tell us where the fish is being detected. In this example, we have three detection site codes for two detection sites: GOJ indicates Little Goose Dam; GRJ and GRX indicate Lower Granite Dam.

Next we look at the coil ids to determine what route the fish took through the detection site (i.e., whether or not the fish ended up back in the river, was transported, sampled, etc.). Please refer to the data sample below. This sample is a excerpt from a file in **PitPro** observation file format. For more about observation files see the section under the heading [Observation File](#).

-- PTAGIS data sample ---

```
RNI96102.AA1 222A4E2254 GRJ 10-may-1996 23:04:17 1 2C XX 28.42
RNI96102.AA1 222A4E2254 GRJ 10-may-1996 23:26:01 2 36 38 28.43
RNI96102.AA1 222A4E2254 GRJ 10-may-1996 23:27:01 1 3A XX 28.44
RNI96102.AA1 222A4E2254 GRX 10-may-1996 23:22:22 1 74 XX 28.43
RNI96102.AA1 222A4E2254 GRX 10-may-1996 23:22:22 1 76 XX 28.43
RNI96102.AA1 222A4E2254 GRX 10-may-1996 23:22:26 1 80 XX 28.43
RNI96102.AA1 222A4E2254 GRX 10-may-1996 23:22:26 1 82 XX 28.43
RNI96102.AA1 222A4E2254 GRX 10-may-1996 23:22:26 1 86 XX 28.43
RNI96102.AA1 222A4E2254 GOJ 15-may-1996 11:50:57 1 48 XX 32.95
RNI96102.AA1 222A4E2254 GOJ 15-may-1996 11:50:57 1 4A XX 32.95
RNI96102.AA1 222A4E2254 GOJ 15-may-1996 11:50:58 2 4C 4E 32.95
RNI96102.AA1 222A4E2254 GOJ 15-may-1996 11:51:07 1 A6 XX 32.95
RNI96102.AA1 222A4E2254 GOJ 15-may-1996 11:51:08 2 A8 AA 32.95
RNI96102.AA1 222A4E2254 GOJ 15-may-1996 11:51:13 1 56 XX 32.95
RNI96102.AA1 222A4E2254 GOJ 15-may-1996 11:51:14 2 58 5A 32.95
```

-- end sample --

Following is an example of how the detections are analyzed, coil by coil.

```
-- PTAGIS data sample ---  
  
RNI96102.AA1 222A4E2254 GRJ 10-may-1996 23:04:17 1 2C XX 28.42  
RNI96102.AA1 222A4E2254 GRJ 10-may-1996 23:26:01 2 36 38 28.43  
RNI96102.AA1 222A4E2254 GRJ 10-may-1996 23:27:01 1 3A XX 28.44  
RNI96102.AA1 222A4E2254 GRX 10-may-1996 23:22:22 1 74 XX 28.43  
RNI96102.AA1 222A4E2254 GRX 10-may-1996 23:22:22 1 76 XX 28.43  
RNI96102.AA1 222A4E2254 GRX 10-may-1996 23:22:26 1 80 XX 28.43  
RNI96102.AA1 222A4E2254 GRX 10-may-1996 23:22:26 1 82 XX 28.43  
RNI96102.AA1 222A4E2254 GRX 10-may-1996 23:22:26 1 86 XX 28.43  
RNI96102.AA1 222A4E2254 GOJ 15-may-1996 11:50:57 1 48 XX 32.95  
RNI96102.AA1 222A4E2254 GOJ 15-may-1996 11:50:57 1 4A XX 32.95  
RNI96102.AA1 222A4E2254 GOJ 15-may-1996 11:50:58 2 4C 4E 32.95  
RNI96102.AA1 222A4E2254 GOJ 15-may-1996 11:51:07 1 A6 XX 32.95  
RNI96102.AA1 222A4E2254 GOJ 15-may-1996 11:51:08 2 A8 AA 32.95  
RNI96102.AA1 222A4E2254 GOJ 15-may-1996 11:51:13 1 56 XX 32.95  
RNI96102.AA1 222A4E2254 GOJ 15-may-1996 11:51:14 2 58 5A 32.95  
  
-- end sample --
```

A detection on coil 2C at site GRJ in 1996 indicates the "separator" detector, the first detector a fish would pass at Lower Granite Dam. If it is seen here and nowhere else, then the passage route is unknown since the fish could have been returned to the river, been sampled, or transported. Thus, the passage route is unknown; further information is needed. Coil ids 36, 38, and 3A indicate the diversion detector. A fish detected here can either end up returned to river or in the holding tank. We need more information still. The GRX coils 74, 76, 80, 82, and 86 indicate that the fish was returned to river. The proper capture history value for this fish would be a 1, detected and returned to river.

Similarly, the GOJ coil detections 48, 4A, 4C, and 4E indicate the separator gate detector at Little Goose. Coils A6 and A8 indicate the diversion detector. Coils 56, 58, and 5A are the diversion exit detector. This fish should be flagged with a 1 to indicate return to river.

4.0 Program PitPro

Needless to say, repeating the above exercise for thousands of fish would become tedious, which is why we developed a data handling tool to do the work. Program **PitPro** takes data in the form of raw PTAGIS files and runs the necessary coil and detection site recognition algorithms to create the capture histories for use as input to **SURPH**.

In addition, **PitPro** can be set up to check for errors in the data. For instance, a fish detected downstream "before" being detected upstream. These errors are removed from the output and recorded in a separate error file.

Other outputs include a travel time file that contains travel times to each detection site for each fish, a detection date file that contains detection dates in day-of-year to each detection site for each fish, and a coil hit file that counts the number of coil hits at each site for each fish.

Program **PitPro** was designed to work on the Snake and Columbia rivers. The program can be extended to work on other systems. All that is needed is site-specific information for the new system. This information is added to the program by editing the source code and so any modifications of this type must be made by the Columbia Basin Research staff at the University of Washington.

4.1 Input Files

Program **PitPro** uses PTAGIS observational and tag files to construct the capture history files needed for **SURPH**. Release data and/or mortality data can also be used to refine the analysis. The release date file allows travel times to be calculated and is necessary when running in the juvenile/adult mode (see [Command Line Flags](#)) to determine the year of the adult return. The mortality file records fish mortalities that occurred during tagging, handling, and transport of fish, and is used to remove these fish from the resulting **SURPH** file.

4.1.1 Observation File

The example below shows the proper format for an observation file from PTAGIS on coil detections. This file would contain data for all fish in the release. The file must have exactly 8 columns with dates in the proper format. Currently, **PitPro** recognizes both dates in the 03-feb-1997 format and the equivalent 02/03/97 format. Any missing coil codes should be replaced by XX.

-- begin sample --

```
RNI96102.AA1 22131C273C GOJ 22-apr-1996 07:12:43 1 40 XX 9.76
RNI96102.AA1 22131C273C GOJ 22-apr-1996 07:12:43 1 42 XX 9.76
RNI96102.AA1 22131C273C GOJ 22-apr-1996 07:12:44 2 44 46 9.76
RNI96102.AA1 22131C273C GOJ 22-apr-1996 07:12:54 1 A0 XX 9.76
RNI96102.AA1 22131C273C GOJ 22-apr-1996 07:12:55 2 A2 A4 9.76
RNI96102.AA1 22131C273C GOJ 22-apr-1996 07:13:49 2 54 56 9.76
RNI96102.AA1 22131C273C MCJ 26-apr-1996 16:34:12 2 00 02 14.15
RNI96102.AA1 22131C273C MCJ 26-apr-1996 16:36:47 1 50 XX 14.15
RNI96102.AA1 22131C273C MCJ 26-apr-1996 16:36:51 1 30 XX 14.15
RNI96102.AA1 22131C273C MCJ 26-apr-1996 16:36:52 1 32 XX 14.15
RNI96102.AA1 22131C273C MCJ 26-apr-1996 16:36:56 1 34 XX 14.15
```

-- end sample --

4.1.2 Tag File

Tag files from PTAGIS give **PitPro** the release information it needs to recognize and form PIT-tag release groups. These files, along with the observation files, are used to produce the capture histories of a release group of fish. The sample below shows the proper format for a tag file. The columns are: tag file id, PIT code, species, rearing type, length, and tag session flag (with information on special circumstance related to the fish). The session flag isn't currently used, but the program still expects 6 columns.

-- begin sample --

```
RNI96102.AA1 22132D3337 1 H 121 XX
RNI96102.AA1 2213380B78 1 H 126 XX
RNI96102.AA1 2213383177 1 H 178 XX
RNI96102.AA1 22131C273C 1 H 132 XX
RNI96102.AA1 22131C3661 1 H 160 XX
RNI96102.AA1 22131C5950 1 H 183 XX
RNI96102.AA1 22131D243F 1 H 127 XX
RNI96102.AA1 2213261007 1 H 127 XX
RNI96102.AA1 2213271B42 1 H 126 XX
RNI96102.AA1 22132B0C6A 1 H 139 XX
RNI96102.AA1 2213453C5D 1 H 127 XX
RNI96102.AA1 2214463D42 1 H 189 XX
RNI96102.AA1 22133F244F 1 H 135 XX
```

-- end sample --

4.1.3 Mortality File

A file that simply contains a list of PIT codes, one per line, each representing a tagging or handling mortality that was not released but whose PIT code may still be in the tag file.

```
-- begin sample --  
  
1F41622618  
1F590C3B41  
1F5947665B  
1F5E1C1453  
1F5F6D2174  
1F5F6E3460  
1F72797303  
1F7637161E  
200935663C  
  
-- end sample --
```

4.1.4 Release Date File

A release data file contains a tag file id, a release date, and a release time. An example of a release file is shown below.

```
-- begin sample --  
  
RNI96096.6A1 4/06/96 14:30:00  
RNI96099.6B1 4/08/96 15:28:00  
RNI96100.6C1 4/09/96 11:00:00  
RNI96102.6D1 4/11/96 15:00:00  
RNI96102.A11 4/12/96 13:00:00  
RNI96102.AA1 4/12/96 13:00:00  
RNI96103.6E1 4/12/96 15:00:00  
RNI96104.AB1 4/14/96 11:15:00  
RNI96106.6F1 4/15/96 15:30:00  
RNI96106.AC1 4/16/96 11:45:00  
RNI96107.6G1 4/16/96 16:00:00  
RNI96108.6H1 4/17/96 15:00:00  
  
-- end sample --
```

4.2 Run Configuration

In a single run of **PitPro**, you can process any of a number of data files, either individually or grouped. There are many options that define the details of what the input and output of the run will be. The run is configured via the **PitPro** main window. Configuring the run consists of choosing the data input files, selecting the rearing type and species, setting up the output file name suffixes, specifying the format of the SURPH output file, and making certain selections that effect the error detection process.

The main window consists of a tabbed dialog with four tabs: [Run Setup](#), [Settings](#), [Input Files](#), and [Output Files](#). The first tab, **Run Setup**, is shown below in Fig. 1 .

Fig. 1. PitPro Main Window

The screenshot shows the PitPro Main Window with the 'Run Setup' tab selected. The window has a title bar 'PitPro' and a menu bar with 'File', 'Edit', 'Data', 'Output', and 'Help'. Below the menu bar is a gear icon. The 'Run Setup' tab contains a 'Data' section with three dropdown menus: 'Group' (set to 'pw1h01'), 'Mortality File' (set to 'none'), and 'Release Date File' (set to 'none'). Below these is an 'Add' button. The 'Runs' section contains a table with 7 rows and 4 columns: 'Group', 'Mortality File', and 'Release File'. The first row is highlighted. Below the table is a checkbox labeled 'Combine runs into one' which is currently unchecked.

	Group	Mortality File	Release File
1			
2			
3			
4			
5			
6			
7			

☐ Combine runs into one

4.2.1 Run Setup Tab

The run setup tab is where the input files are chosen and the runs are defined. A run consists of a set of four input files: the tag file, the observation file, the mortality file, and the release date file. These runs can be handled separately so that each produces separate output, or they can be grouped into a single file, so that one set of output is generated. The data is selected via drop-down menus. The **Group** menu determines the tag and observation files to use. The menu contains prefixes for the data files so that the value shown below, pw1h01, will result in pw1h01.tag and pw1h01.obs being used for the run. The prefixes that appear in the menu are determined by searching the input data directory (defined in the [Input Files Tab](#)) for all observation and tag files that have a matching prefix. The observation and tag files, as well as the mortality and release date files, are distinguished by a suffix that is defined on the [Input Files Tab](#).

To add a dataset, make selections in the **Group**, **Mortality File**, and **Release Date File** drop-down menus, and then click the add button. The run will be displayed in the **Runs** table ([Fig. 2](#)). Note that it is not necessary to select a mortality file or a release date file to define a valid run. The presence of a mortality file will enable **PitPro** to remove mortalities from the input files during the error checking phase. The release date file will allow travel time calculations from release to any detection site. In the example shown in [Fig. 2](#), the default values of "none" have been selected.

Fig. 2. Adding a Dataset

PitPro

File Edit Data Output Help

Run Setup Settings Input Files Output Files

Data

Group: pw1h01

Mortality File: none

Release Date File: none

Add

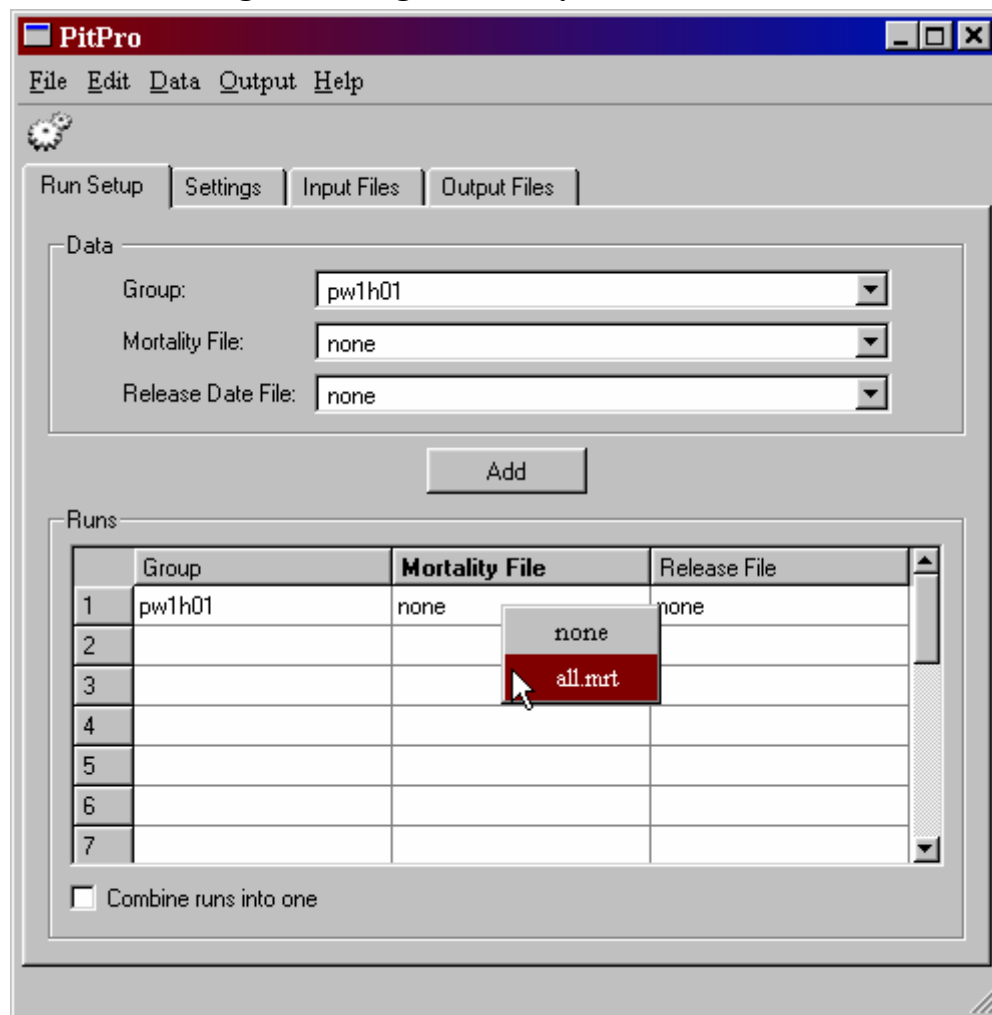
Runs

	Group	Mortality File	Release File
1	pw1h01	none	none
2			
3			
4			
5			
6			
7			

☐ Combine runs into one

Once a run has been defined, it is possible to edit it or to remove it completely. To delete the run, right-click with your mouse in the **Group** column. This will bring up a menu with one item: **Delete Run**. Select this item to delete the run completely. If you wish instead to change the selection for either Mortality File or Release Date File, right-click on these items to bring up a menu that will contain a list of possible selections ([Fig. 3](#)). Select the new value from the list.

Fig. 3. Adding a Mortality File to a Dataset

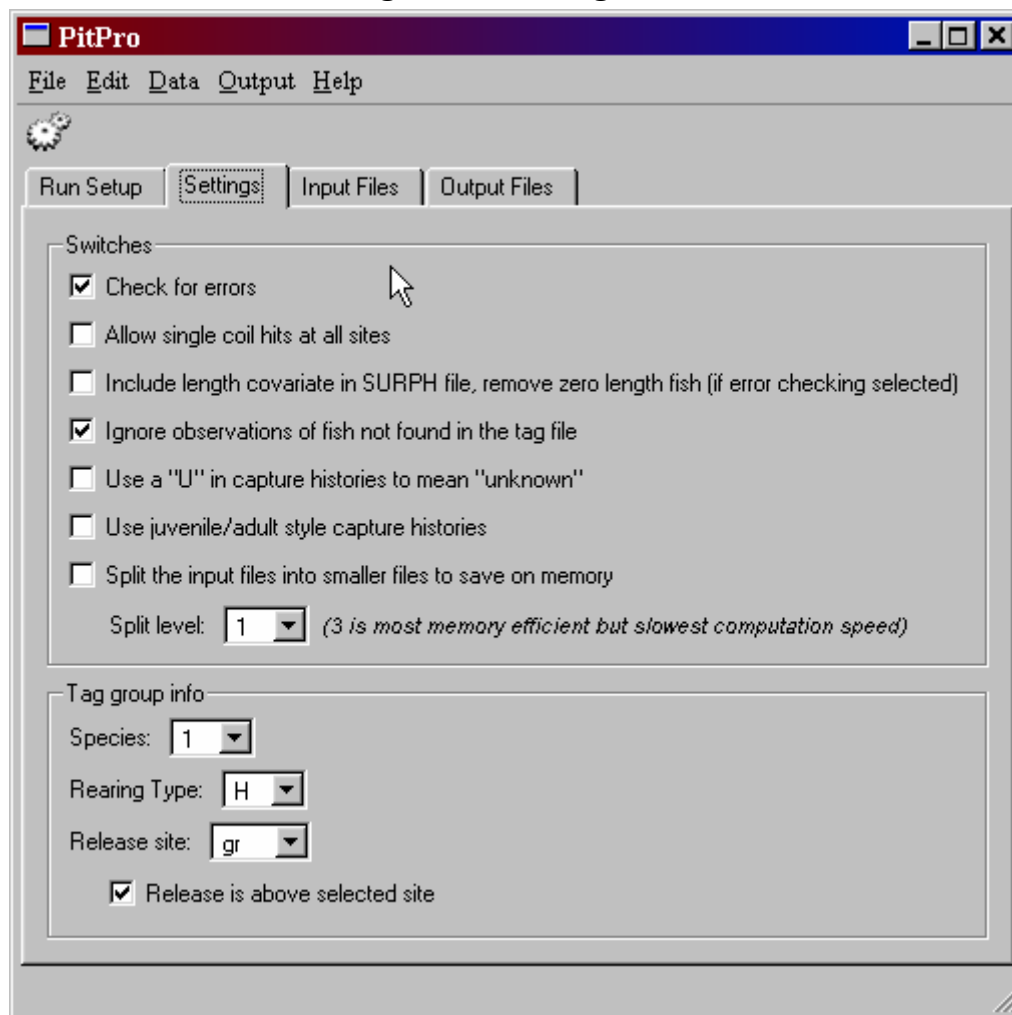


The runs can be processed as separate runs, or as a single combined run. Check the **Combine runs into one** box to combine the runs.

4.2.2 Settings Tab

The settings tab allows you to further configure the run. The settings tab is shown in [Fig. 4](#).

Fig. 4. The Settings Tab



Listed below is a description of each of the setting options.

Check for Errors: If this is checked, **PitPro** will check the input for errors and, if warranted, remove the errors. The program can check for a variety of possible errors. See [Error File](#) for a detailed description of the errors.

Allow single coil hits at all sites: Certain sites like Lower Granite and McNary dams have a sophisticated enough detection system that we should never see a fish that was detected on only one coil at these sites. On the other hand, many sites have a simple detector configuration and a single coil hit is common. By default, **PitPro** ignores these single coil hits at the more complicated sites, while it allows single coil hits at the other less developed detection sites. Check this box if you want to allow single coil hits at all sites.

Include length covariate in SURPH file, remove zero length fish (if error checking selected): Include the length of a fish in the SURPH output file. Normally, a fish with zero length is not flagged as an error. If this box is checked, then a fish with zero length will be flagged as an error and removed from the tagging file and subsequent analysis.

Ignore observations of fish not found in the tag file: Check this box if **PitPro** should only use fish that appear in the tag file.

Use a "U" in capture histories to mean "unknown": Normally a fish is flagged as undetected ("0"), returned to river ("1"), or censored ("2"). The censored fish fall into three categories: censored (sampled/holding tank), transported, or unknown. If this box is checked, **PitPro** will flag the fish with a "U" for “unknown” instead of a "2". A fish with an “unknown” return history is treated as a censored fish in SURPH.

Use juvenile/adult style capture histories: In juvenile mode, the default for a given detection site, a fish will be flagged with one of 3 flags: a "0" for not detected, a "1" for detected and returned to river, or a "2" for censored. In juvenile/adult mode, the following flags are used:

- 0: Undetected
- 1: Juvenile – Detected and returned to river
- 2: Juvenile – Detected and censored (never to be seen again)
- 3: Juvenile – Transported (possibly seen again as adult)
- A: Adult – Detected the year after release
- B: Adult – Detected the second year after release
- C: Adult – Detected the third year after release
- D: Adult – Detected the fourth year after release
- E: Adult – Fifth year and older

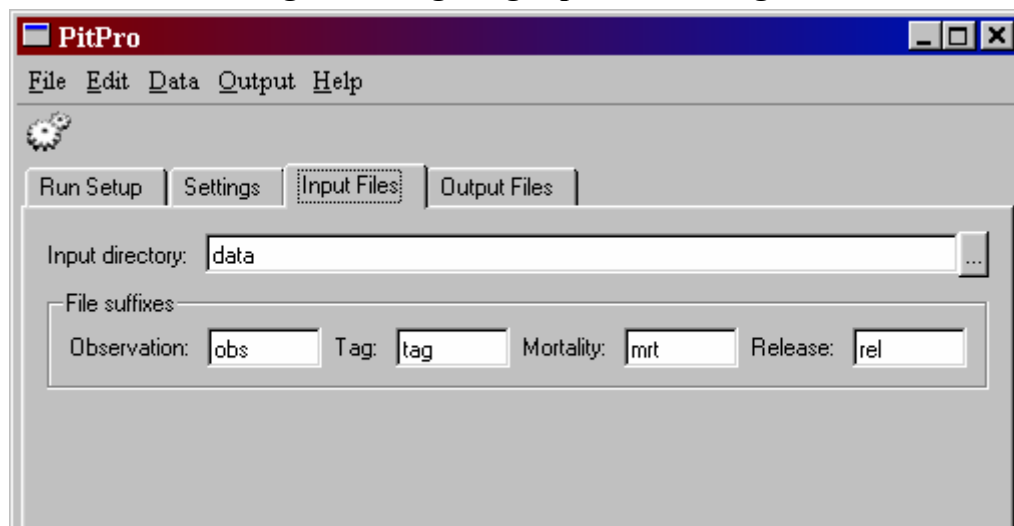
Split the input files into smaller files to save on memory: This is helpful with very large files. When this box is checked, **PitPro** will split the input files into smaller more manageable files thereby saving on system resources. The split files are temporary files and will be removed at the end of the run. The files are split based on PIT code. If the split level is at 1, the default, the files are split based on a common character in the last position of the PIT code. For instance, all PIT codes ending in a 9 go into one file, all PIT codes ending in an F go into another. If the split level is at 2, the last 2 characters are used causing more split files. There is a tradeoff between the amount of time it takes to manage the files and the amount of time it takes for the computer to manage memory when dealing with a large file. Use this option with very large files to greatly speed up computation.

In the **Tag group info** area, the user can define specific traits regarding the release group: the species, rearing type, and release site. The release site is stated relative to the first field in the capture history. It is either at or "above" the site. So if the first field is going to be Lower Granite Dam, and the fish were released in the Clearwater River, the release site would be **gr** and the **Release is above selected site** box should be checked.

4.2.3 Input Files Tab

The Input Files tab is shown below ([Fig. 5](#)). This tab is where the data input directory (folder) is defined along with the data file suffixes. In the example shown below, the data directory is "data", the observation files end in ".obs", the tag files end in ".tag", etc. **PitPro** will search for a subdirectory called "data." Use "." to indicate the current directory.

Fig. 5. Configuring Input File Settings

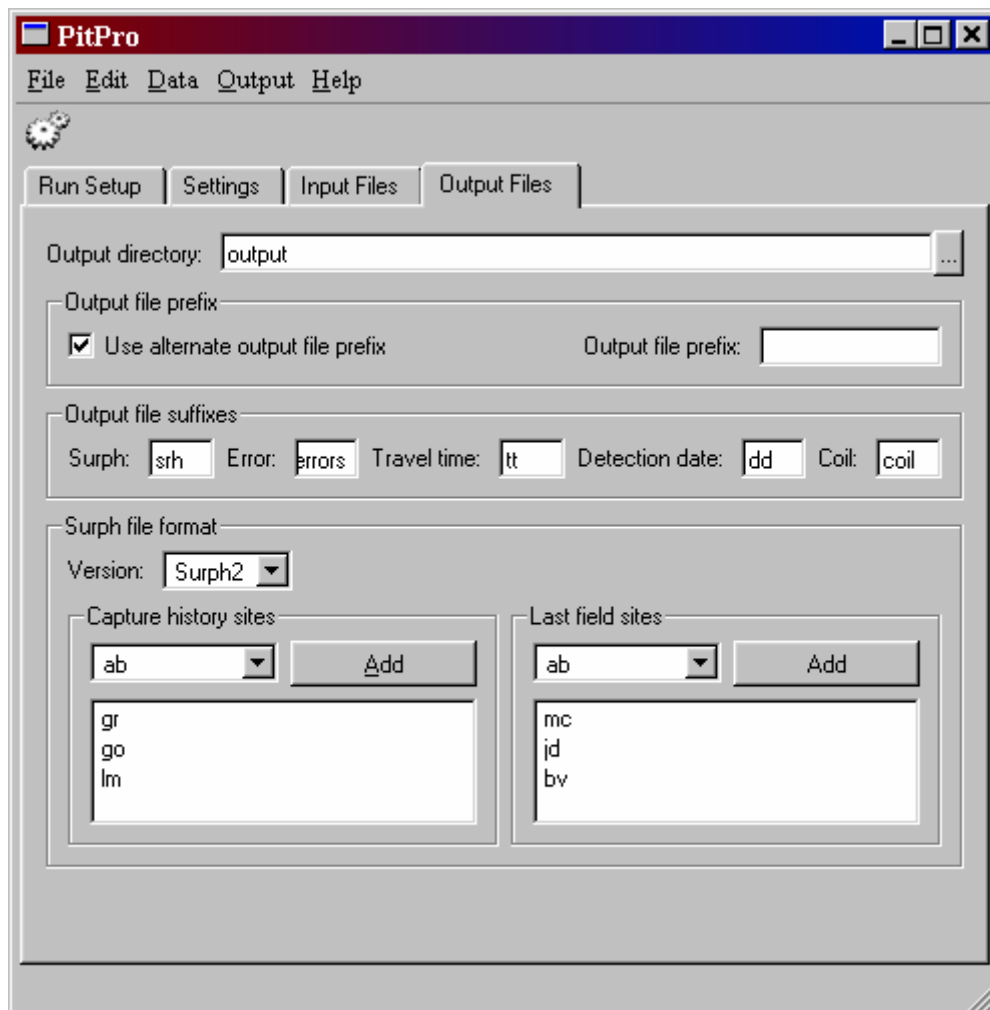


4.2.4 Output Files Tab

The Output Files tab ([Fig. 6](#)) allows the user to specify both where to send the output files and what to name them, and to specify the details of what the SURPH file should look like. The output directory is the directory (folder) where the output files should be written. In the example below, the output directory is set to "output"; **PitPro** will search the current directory for a file named "output." Use "." to specify the current directory.

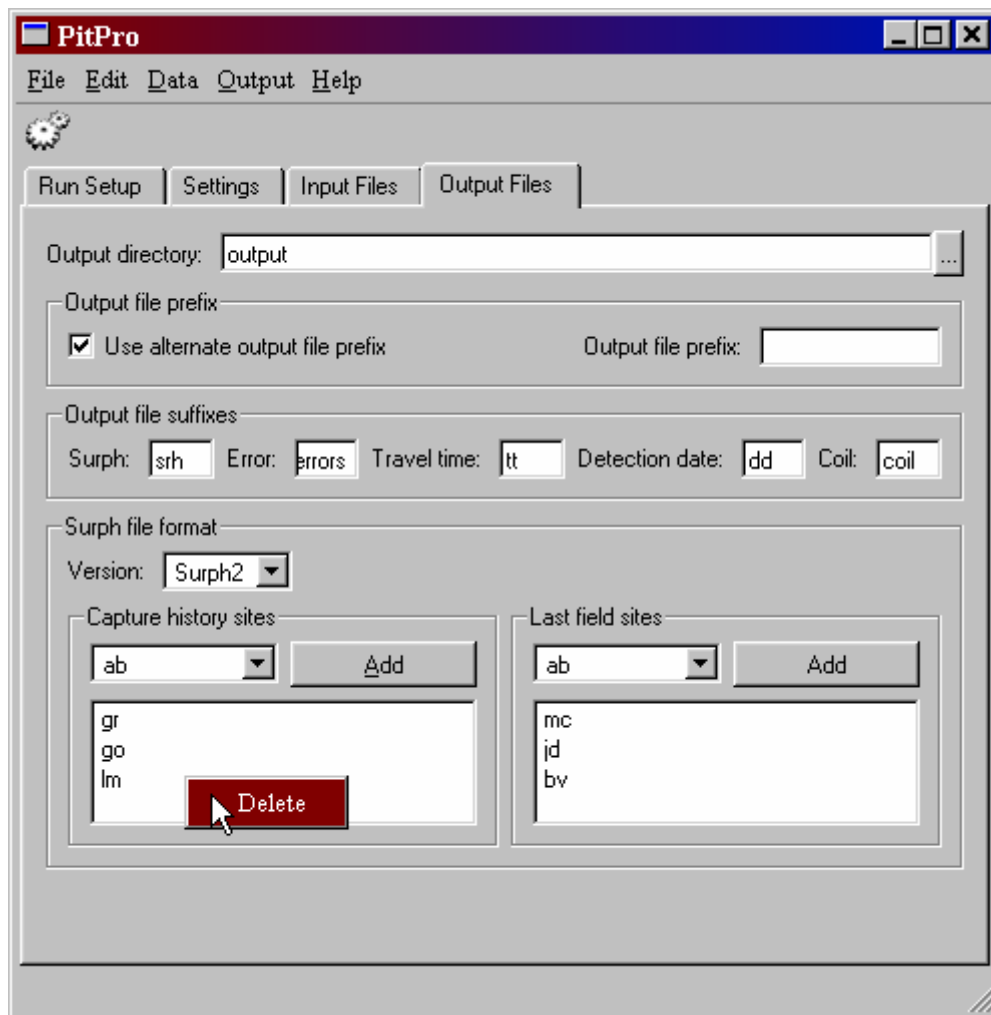
The output file suffixes determine how the output files should be named. By default, **PitPro** will use the group prefix followed by the given prefixes. In the current example, for instance, the SURPH file would be named pw1h01.srh. If an alternate prefix is desired, check the box labeled **Use alternate output file prefix** and specify the prefix in the space provided. This is necessary when grouping runs based on several prefixes together and can be useful in other cases when distinguishing between runs that are based on the same prefix but use different settings.

Fig. 6. Configuring Output File Settings



The remaining portion of the Output Files tab is for configuring the format of the SURPH output file. There are two versions of SURPH data files: SURPH 1, and SURPH 2. The version can be selected here. In addition, the main fields and last fields can be selected. The **Capture history sites** are the fields in the capture history for which it will be possible to calculate survivals. The **Last field sites** are the fields that will be pooled into the last field in the capture history. In other words, multiple downriver sites may be treated as a single terminal detection site. To add a field, select the field from the list and click add. To delete a field, right-click with the mouse and select delete as shown in the example [Fig. 7](#).

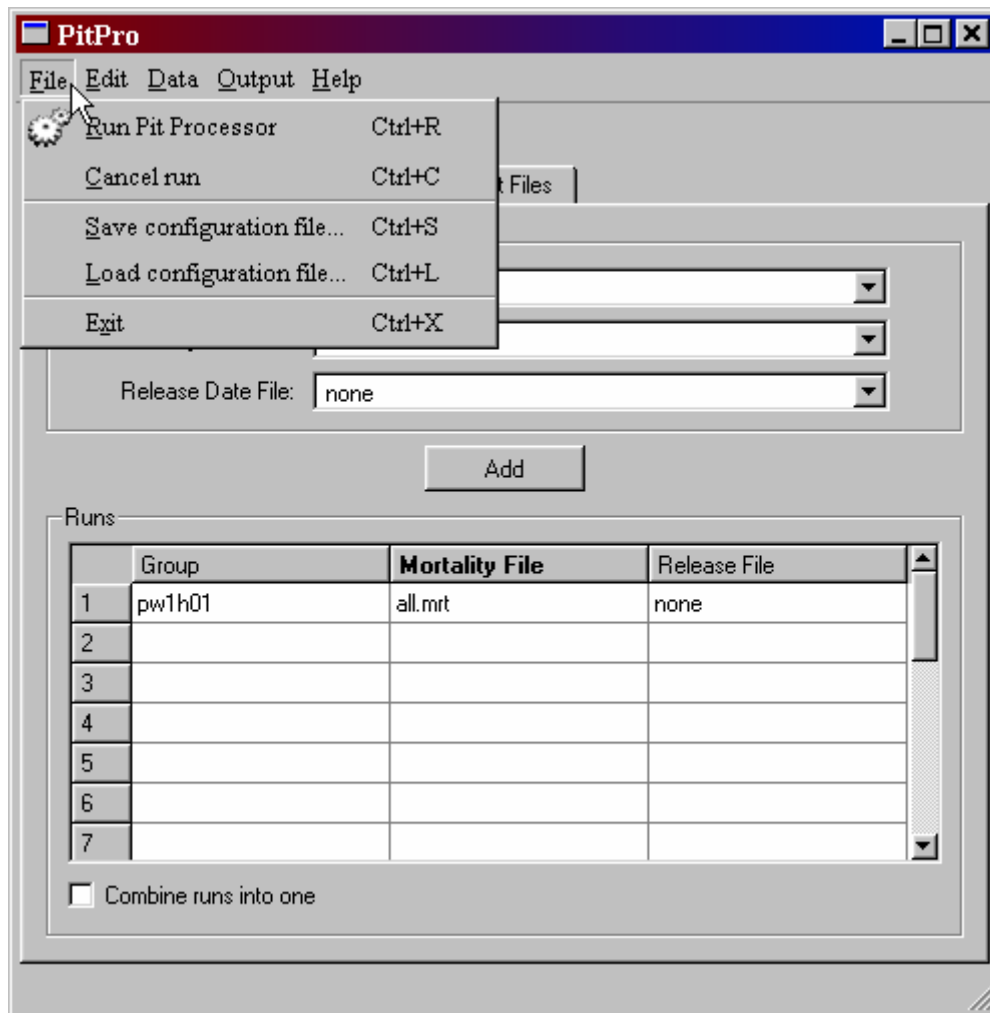
Fig. 7. Deleting a Site



4.2.5 File Menu

The file menu (Fig. 8) allows the user to start or cancel a run, and to either save the current configuration, or to load a previously saved configuration. Select **Run Pit Processor** from the file menu or click the "Cogs" icon on the toolbar, to start the run. To cancel the run, select **Cancel run**. The current configuration can be saved by selecting **Save configuration file** or a previously saved configuration can be loaded by selecting **Load configuration file**.

Fig. 8. The File Menu



4.3 Output Files

4.3.1 SURPH File

An example of a SURPH file is illustrated below for the case of a release above Lower Granite Dam with four downstream detection sites at Lower Granite, Little Goose, Lower Monumental and below Lower Monumental. This is based on the settings for **Capture history sites** and **Last field sites** as defined on the **Output Files Tab** of the main window.

The meaning of the flags depend on the mode of operation. In the default mode, the flags have the following meaning:

- 0 - Undetected
- 1 - Detected and returned to river
- 2 - Censored – Detected and removed from the system

In addition, if the **Use a "U" in capture histories to mean "unknown"** box is checked on the **Settings Tab**, a "U" will appear to indicate that it is uncertain whether a fish was returned to the river or not. Normally, a "U" detection will be converted to a "2", meaning censored.

If the program is run in Juvenile/Adult mode by checking the **Use juvenile/adult style capture histories** box on the **Settings Tab**, the capture history has some additional capture codes. Here are the meanings of the capture codes in this mode:

- 0: Undetected
- 1: Juvenile – Detected and returned to river
- 2: Juvenile – Detected and censored (never to be seen again)
- 3: Juvenile – Transported (possibly seen again as adult)
- A: Adult – Detected the year after release
- B: Adult – Detected the second year after release
- C: Adult – Detected the third year after release
- D: Adult – Detected the fourth year after release
- E: Adult – Fifth year and older

In the following example, the columns in the capture history are as follows:

- Column 1: PIT code
- Column 2: Release (Above Lower Granite)
- Column 3: Lower Granite
- Column 4: Little Goose
- Column 5: Lower Monumental
- Column 6: Downriver of Lower Monumental

```
-- start sample --  
  
#  
# CaptHist v.PitPro 1.0  
#  
Surph2  
pwlh01  
npop 1  
nper 4  
ntag 100  
full_hist  
tagID present  
captureHistories  
222A4E2254 1 1 1 0 0  
22294C637A 1 0 0 0 0  
22146E624E 1 0 1 0 0  
2214670160 1 0 0 1 0  
221464261D 1 0 0 0 1  
22142A006D 1 0 0 1 0  
2214167A3B 1 0 0 1 0  
22140C0306 1 0 0 1 1  
  
-- end sample --
```

4.3.2 Travel Time File

A fish may be detected several times at a dam. Here we record the travel time from release to the first detection at a given site along with the travel time from release to the last detection at a given site.

The first line in the file is the header giving information about the data that follows. The header for this file looks like:

```
pitcode gr gr go go lm lm mc mc jd jd bv bv tw tw
```

From the header we can determine that, for instance, the second and third columns pertain to Lower Granite detections. In the travel time file as well as the detection date file, the convention is that the first of the two columns pertains to the time of the first detection at the site and the second pertains to the time of the last detection at a site.

The columns are determined by the field configuration defined on the [Output Files Tab](#) of the main window and include both **Capture history sites** and **Last field sites**. Any field listed as either a main field or a last field has two columns associated with it in the travel time file (and the detection date file).

Here is an example.

```
-- start sample --
```

```
pitcode gr gr go go lm lm mc mc jd jd bv bv
22131C273C 0.000000 0.000000 9.758333 9.759028 0.000000 0.000000 14.148611
15.025000 0.000000 0.000000 0.000000 0.000000
22131C3661 0.000000 0.000000 8.398611 8.402778 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
22131C5950 25.184028 25.793750 0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
22131D243F 0.000000 0.000000 0.000000 0.000000 19.367361 19.576389
29.576389 29.577778 0.000000 0.000000 0.000000 0.000000
2213232F29 13.236806 13.242361 0.000000 0.000000 18.411111 18.744444
0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
2213261007 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 30.296528
30.297222 0.000000 0.000000 0.000000 0.000000
2213271B42 0.000000 0.000000 16.300000 16.302083 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
```

```
-- end sample --
```

4.3.3 Detection Date File

A fish may be detected several times at a detection site. Here we record the first detection date and the last detection date. All date values are given as Julian day plus time of day, represented by a fraction. For instance, in the sample below, the release date (agr) for the first fish (22131C273C) is 2450186.541667. This is the Julian day of 4/12/96 (2450186) plus the fraction represented by 13:00:00 (roughly 541667). The Julian day is used instead of the day-of-year, so that travel times contain year information as well as day-of-year. This allows for calculations of travel times that span more than a year; for instance, when adult returns are involved, a "0.000000" indicates no detection.

In the detection date file, there are two columns for each of the **Capture history sites** and each of the **Last field sites** defined on the **Output Files Tab** of the main window. These fields are given in the one-line header of the file. The first column of the pair contains first detection date at the site, the second contains last detection date at the site. These pairs are preceded on each line by the PIT code of the fish and the release date for that fish. If no release date information is available, this number will be 0. With this information, travel times from any site to any other site, or from release to any site, may be calculated. The first column is the PIT code, the second is the release date. If no release date file was give, or a release date was not found for the given group, the release date will be reported as "0.000000".

-- start sample --

```
pitcode agr gr gr go go lm lm mc mc jd jd bv bv
22131C273C 2450186.541667 0.000000 0.000000 2450196.300000 2450196.300694
0.000000 0.000000 2450200.690278 2450201.566667 0.000000 0.000000 0.000000
0.000000
22131C3661 2450186.541667 0.000000 0.000000 2450194.940278 2450194.944444
0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
22131C5950 2450186.541667 2450211.725694 2450212.335417 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
22131D243F 2450186.541667 0.000000 0.000000 0.000000 0.000000
2450205.909028 2450206.118056 2450216.118056 2450216.119444 0.000000
0.000000 0.000000 0.000000
2213232F29 2450186.541667 2450199.778472 2450199.784028 0.000000 0.000000
2450204.952778 2450205.286111 0.000000 0.000000 0.000000 0.000000 0.000000
0.000000
2213261007 2450186.541667 0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 2450216.838194 2450216.838889 0.000000 0.000000 0.000000 0.000000
2213271B42 2450186.541667 0.000000 0.000000 2450202.841667 2450202.843750
0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
```

-- end sample --

4.3.4 Error File

When the **Check for Errors** box is checked on the [Settings Tab](#), **PitPro** checks the data for any errors and outputs whatever error information it finds to a file. If no errors are found, the file will not be created.

The errors are categorized into those that cause fish to be removed from the file and errors that are recorded but do not result in the fish being removed from the file. The second column has either a 1 to indicate that the error caused removal or a 0 to indicate that the error is a warning only and the fish was not removed.

The error file has one line for each fish and consists of a series of either ones or zeros. A 1 in a given column indicates a specific type of error has occurred, a 0 indicates no such error. A fish is recorded in the error file only if it has at least one error.

Here is a brief description of the error columns.

Column 1: PIT code

Column 2: Removal status (1 = removed, 0 = not removed)

Column 3: Duplicate tag in tag file (not implemented)

Column 4: Negative travel time

Column 5: Fish length of zero

Column 6: Fish detected upstream after downstream detection

Column 7: Fish detected upstream of release

Column 8: Mortality in observation file

Column 9: Mortality in tag file

Column 10: Wrong species

Column 11: Wrong rearing type

Column 12: Fish not known to be returned to river

Column 13: No release date for fish

Column 14: Fish not in tag file

Lower Granite Coil errors

Column 14: Detection at diverter and sample

Column 15: Detection at diverter and raceway

Column 16: Detection at raceway and downriver

Column 17: Detection at sample and downriver

Little Goose Coil errors

Column 18: Detection at diverter and raceway

Column 19: Detection at diverter and sample

Column 20: Detection at diverter exit and raceway

Column 21: Detection at diverter exit and sample

Column 22: Detection at raceway and downriver

Column 23: Detection at sample and downriver

Lower Monumental Coil errors

Column 24: Detection at diverter and raceway

Column 25: Detection at diverter and sample

Column 26: Detection at diverter exit and raceway

Column 27: Detection at diverter exit and sample

Column 28: Detection at raceway and downriver

Column 29: Detection at sample and downriver

```
-- begin sample --
```

[illegible]

```
-- end sample --
```

4.3.5 Coil File

The number of coil reads at each of the detection sites is recorded in the coil file. The first line in the file is a header line that indicates the capture sites for the data. For instance, fish 2233445D63 was detected on 9 coils at Lower Granite Dam, 11 coils at Little Goose Dam, etc. As with the travel time file and the detection date file, the columns in this file are determined by the settings for **Capture history sites** and **Last field sites** as defined on the [Output Files Tab](#) of the main window.

```
-- begin sample --  
  
pitcode gr go lm mc jd bv  
2233445D63 9 11 11 0 0 0  
22333C5D2E 0 8 0 0 0 0  
223335137C 0 0 8 0 0 0  
222A622B7D 0 0 11 0 0 0  
222A5A5A76 10 0 0 0 0 0  
222A4E2254 9 10 0 0 0 0  
222A4D0856 0 0 11 0 0 0  
222A4A3012 9 0 0 0 0 0  
222A433E39 0 11 0 0 0 0  
  
-- end sample --
```

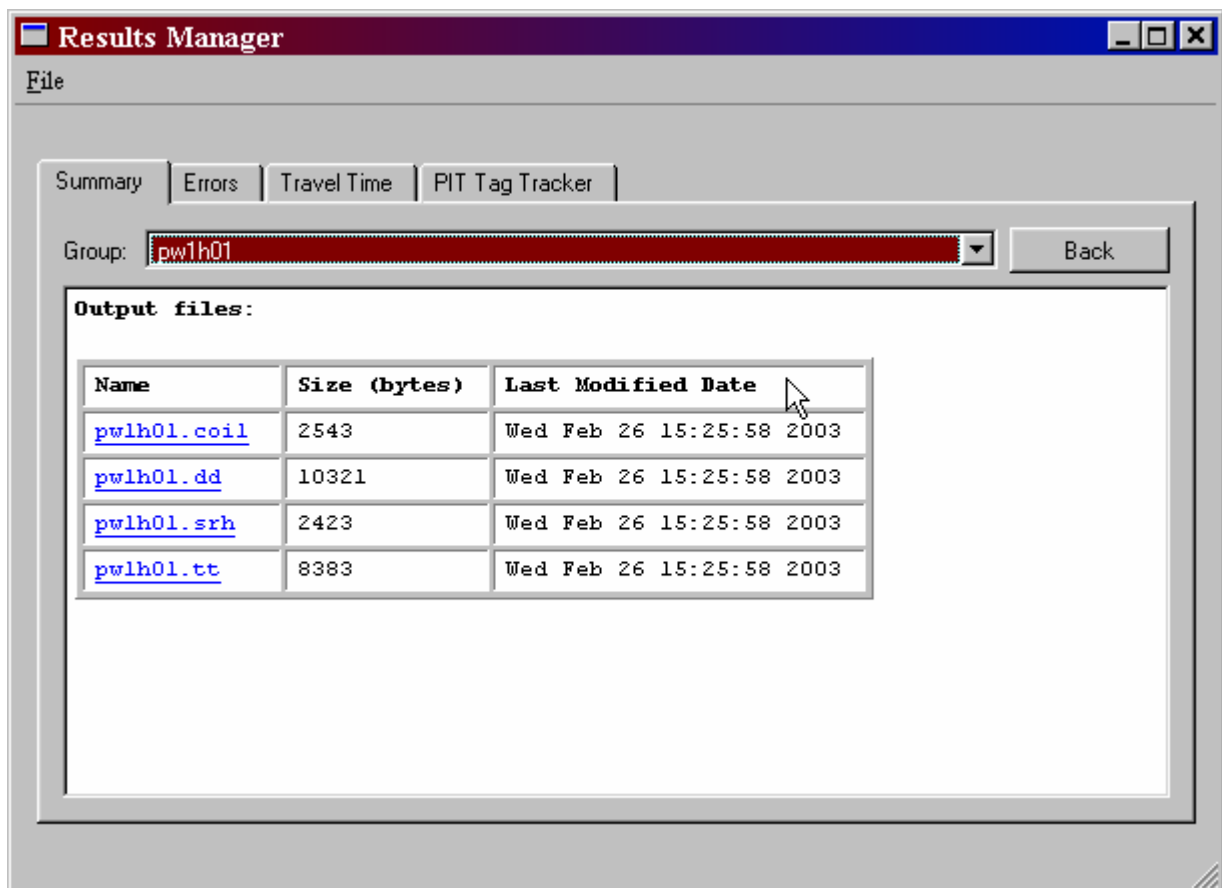
5.0 Results Manager

The **Results Manager** is a new feature that wasn't available in the batch version of Program **CaptHist**. The results manager will make it easier to browse the program results and to research unexpected outcomes.

5.1 Summary Table

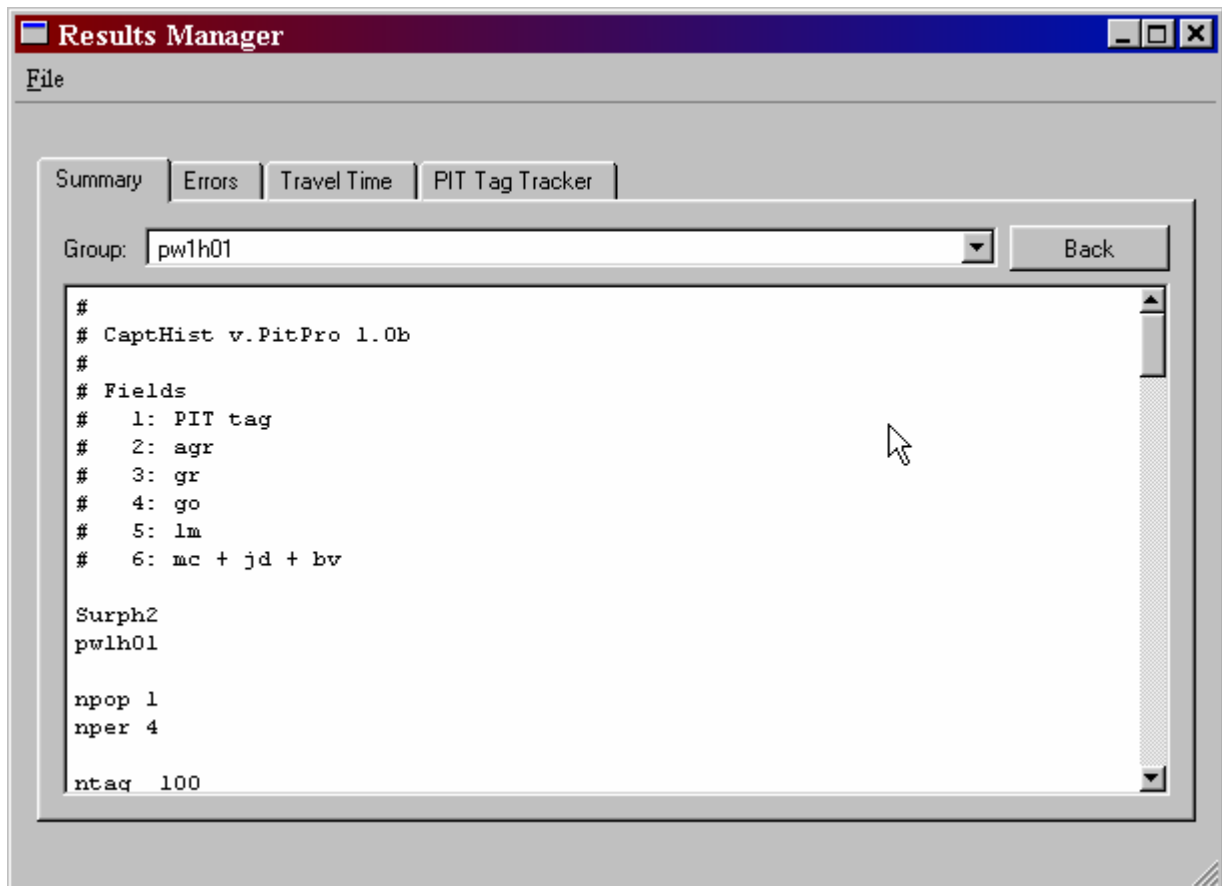
The Summary Table ([Fig. 9](#)) lists all of the output for the selected group. The output files displayed are chosen by searching the data directory for files that have the selected prefix and one of the currently defined output file suffixes. In the example below, we have 4 of the 5 possible files. There is no error file since there were no errors found. The size of the file and the last modified date are also included in the summary.

Fig. 9. Results Manager Output Summary



The file itself may be viewed in the summary window by clicking on the file name in the summary report ([Fig. 9](#)). Below the **SURPH** output file is displayed. To return to the summary page click on the **Back** button.

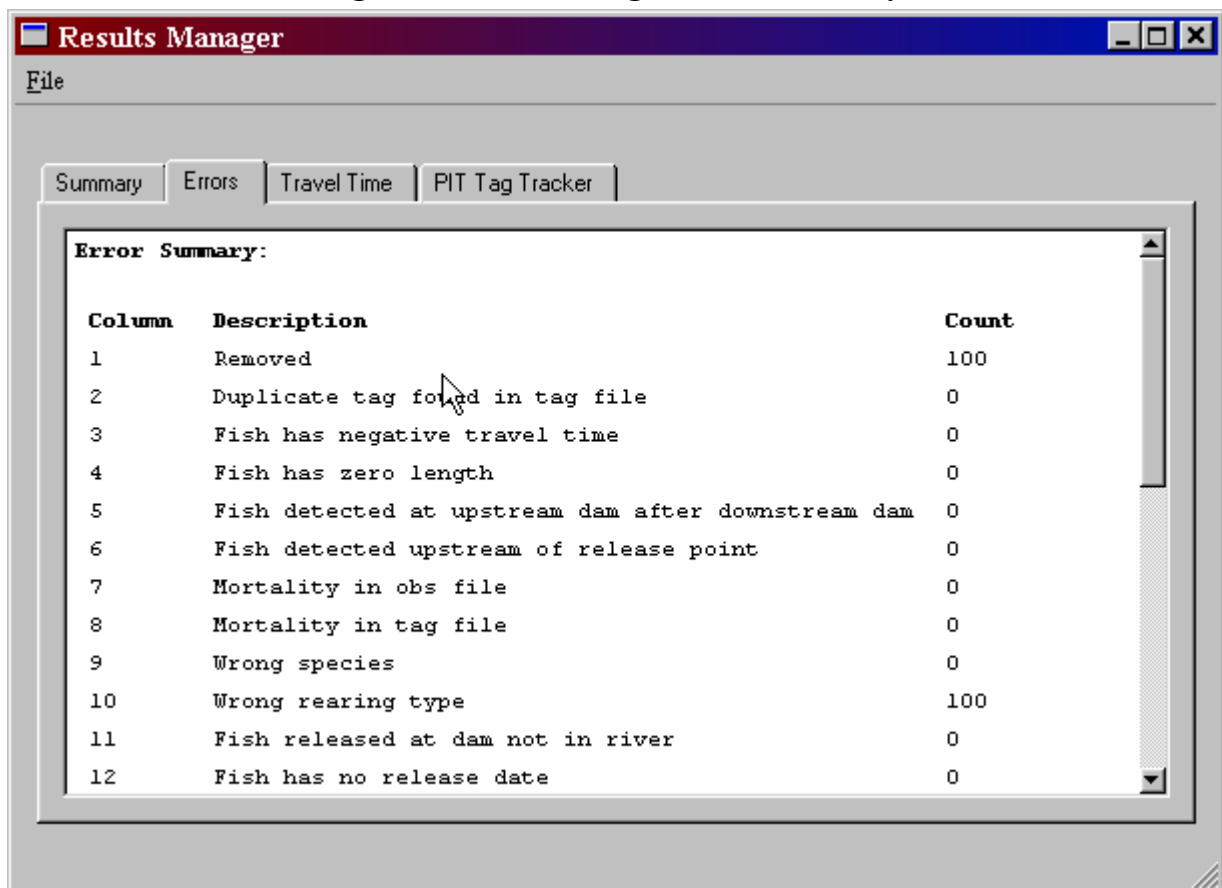
Fig. 10. Results Manager Output Detail



5.2 Errors Tab

In the current example, there were no errors. To show an example of the errors summary, the rearing type was changed to "W" for wild, and the program was rerun. As can be seen in the example below, 100 fish (all of the fish) were removed due to "Wrong rearing type." If you were to view the error file you would notice a 1 in the 10th column (not including the PIT code column), meaning "Wrong rearing type," and a 1 in the first column, meaning that the fish was removed for this error.

Fig. 11. Results Manager Error Summary

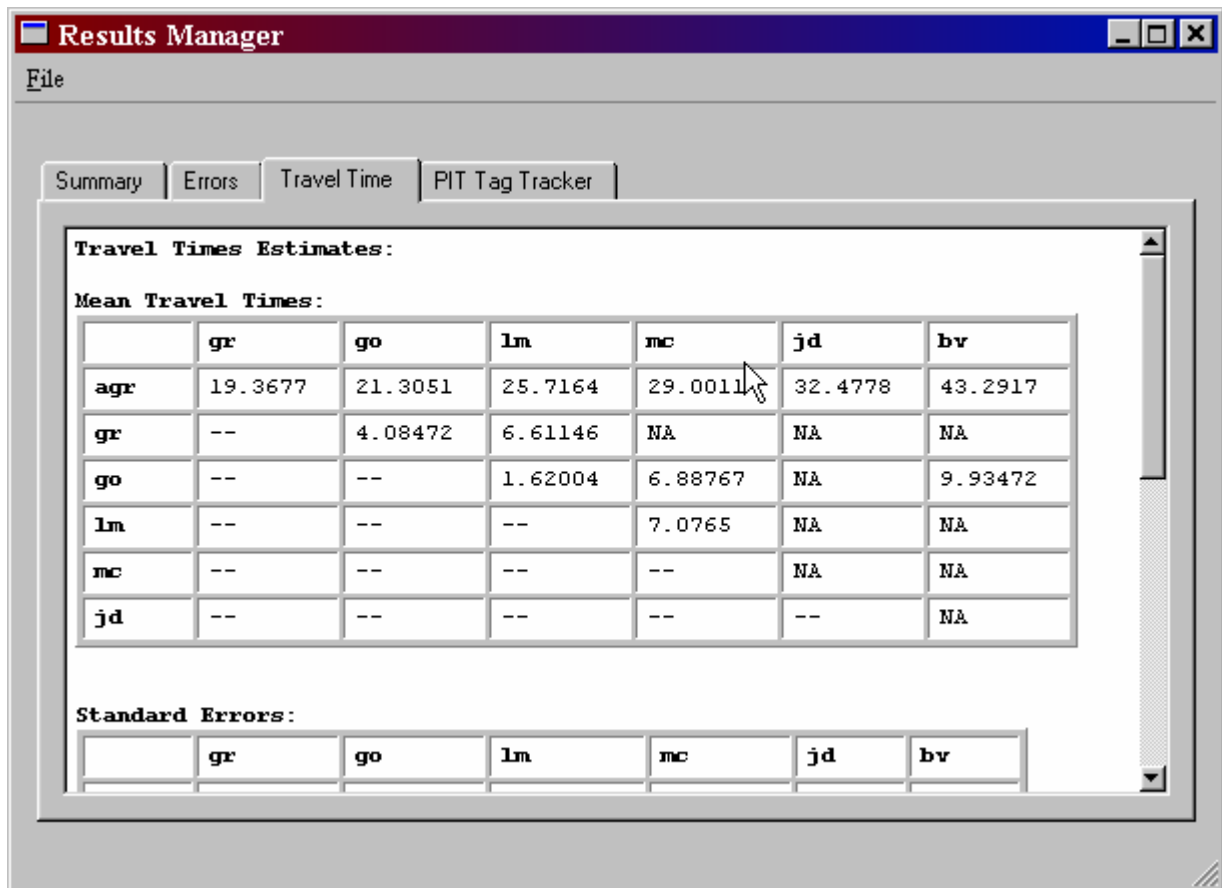


Column	Description	Count
1	Removed	100
2	Duplicate tag found in tag file	0
3	Fish has negative travel time	0
4	Fish has zero length	0
5	Fish detected at upstream dam after downstream dam	0
6	Fish detected upstream of release point	0
7	Mortality in obs file	0
8	Mortality in tag file	0
9	Wrong species	0
10	Wrong rearing type	100
11	Fish released at dam not in river	0
12	Fish has no release date	0

5.3 Travel Time Tab

The travel time tab displays a matrix that gives the arithmetic mean travel time from each possible site to every other possible site. If release date information was provided, the travel time from release to each field is also displayed. Otherwise, "NA" for not available is displayed. Two more similar matrices provide standard errors and counts.

Fig. 12. Results Manager Travel Time Report

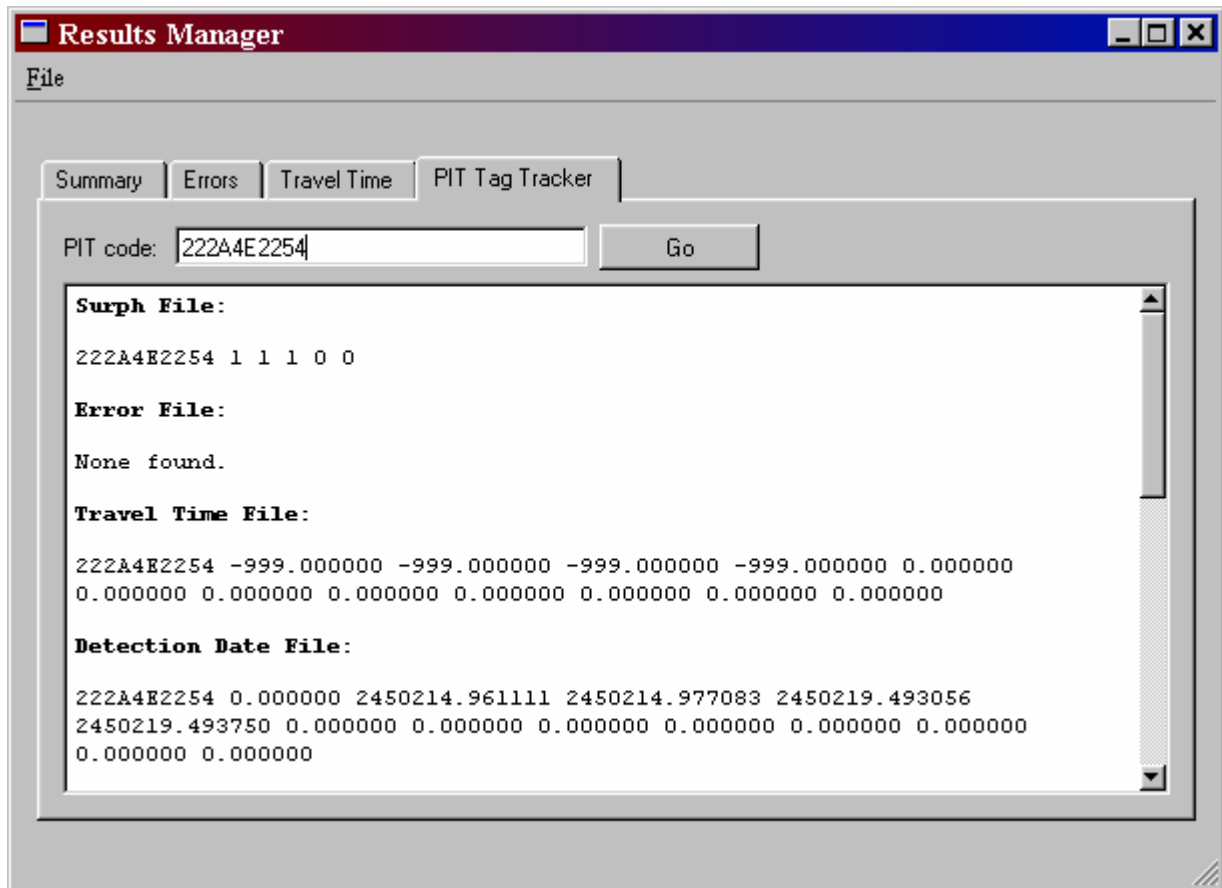


5.4 PIT Tag Tracker Tab

The PIT Tag Tracker combines into one report all of the information for the given PIT code from all data files and output files. This is helpful in researching an unexpected result. For instance, if a fish is flagged with a "2" (censored) the user can easily look at the observation file entries for the fish to verify the answer. If the fish is flagged with a "0" but should have been detected, the user can check the error file entry to see if the fish was removed for errors and then check the tag file entry or the observation file entries to determine the exact cause of the error.

To track a PIT code, either type the PIT code into the area labeled **PIT code**, or cut and paste a PIT code into the area, and click the **Go** button. The results will appear in the summary window.

Fig. 13. Results Manager PIT-Tag Tracker



6.0 CSV Converter

The **CSV Converter** allows easy conversion of comma separated variable (csv) files, as available from PTAGIS, into a format recognized by **PitPro** (and **CaptHist**).

Fig. 14. CSV Converter Main Window

Output type

☒ Observation file format ☐ Tag file format ☐ Release file format ☐ Mortality file format

CSV file: Settings/china/My Documents/Code/PitPro/csv/2001 obs.csv

Output file: Settings/china/My Documents/Code/PitPro/csv/2001 obs.obs

Data

☒ First row contains column headings

	file_id	tag_id	obs_site	obs_date	nreac
1	BCJ01093.CA1	3D9.1BF0FF91D0	GOJ	05/20/01 16:12:46	
2	BCJ01093.CA1	3D9.1BF0FF91D0	GOJ	05/20/01 16:12:46	
3	BCJ01093.CA1	3D9.1BF0FF91D0	GOJ	05/20/01 16:12:46	
4	BCJ01093.CA1	3D9.1BF0FF91D0	GOJ	05/20/01 16:12:46	
5	BCJ01093.CA1	3D9.1BF0FF91D0	GOJ	05/20/01 16:12:56	
6	BCJ01093.CA1	3D9.1BF0FF91D0	GOJ	05/20/01 16:12:57	

OK Cancel

Here is the CSV Converter window. Select the CSV file by either typing the full path to the file in the **CSV file** input box or by browsing for the file by pushing the button to the right of the input box. When you select a csv file, several things happen. The first several lines of the file, separated into columns, are loaded into the display table in order to allow confirmation of the format. If the file has a first row that contains the column headings, check the “First row contains column headings” box, so that the program knows to ignore the first line when converting this file. In addition, as a convenience, when a csv file is selected in the **CSV file** input box, a potential output file name based on the input file name and the output type, selected in the section labeled **Output Type**, appears in the **Output File** input box. This is only done for convenience and the output file name can be changed to whatever name the user wants. Once the csv file and the output file name are selected, click OK to convert the file.

7.0 Running PitPro in Batch Mode: Program **CaptHist**

This batch version of PitPro has an interface that is more or less identical to the older version of the program, **CaptHist**, upon which **PitPro** is based. In fact, the batch version is still named **CaptHist** for continuity. From here on, we will also refer to **PitPro** in batch mode as **CaptHist** but to download the program, get the **PitProBatch** distribution from the **SURPH** web site (<http://www.cbr.washington.edu/paramEst/SURPH>).

7.1 Running Program **CaptHist**

To test your copy, start with the following command from the DOS or UNIX prompt:

```
capthist -n
```

This should create a file called "chrc", a run-time configuration file that is described at length below.

If you have downloaded the complete distribution, you will have some sample data files for input to **CaptHist**: pw1h01.obs and pw1h01.tag. Use the following command to create a SURPH input file:

```
capthist -Gpw1h01 -Ragr
```

This is the most basic way to run **CaptHist**. The -G flag tells **CaptHist** that the group prefix is pw1h01. **CaptHist** will search the data directory (defined in chrc, see below) for the file pw1h01.obs and pw1h01.tag. Multiple groups are possible simply by giving multiple -G flags. The -R flag lets **CaptHist** know where in the system the fish were released, in this case upstream of, or "above," Lower Granite Dam.

The resulting capture history will have five fields. The first is the release field which is always one. The next field is the first detection site the fish will pass, namely Lower Granite Dam. Following are Little Goose Dam, and Lower Monumental Dam, and finally a catch-all field for any detections downstream of Lower Monumental at McNary Dam, John Day Dam, or Bonneville Dam.

The SURPH file format is configured via the chrc run time configuration file, which allows you to select which fields go into the capture history, etc. See the discussion following in Section 6.2.

7.2 Run-Time Configuration: chrc

The chrc file, created in the previous example, allows you to tailor the program's behavior to your specific needs, i.e., if you do not want all five of the output files, or you would like to keep your data in one subdirectory and your output files in another, or you would like to change the fields that appear in the **SURPH** file. By editing the chrc, you can configure **CaptHist** to your own needs.

The fields strings allow you to define capture history fields, the output switches allow you to switch certain files on or off, the directory configuration allows you to keep data and output separated, the file name configuration allows you to name the default mortality and release files (if used), and the file name extension section allows you to define the extension names that work best for your system.

7.2.1 Fields Strings

There are two sets of fields strings: main and last. The Capture history sites refer to the fields in the capture history after release but before the final field. The last field is a catch all that will be 1 if the fish is detected at any one of the detection sites listed in the last field's string. These fields should be a comma-separated list. For example, gr,go,lm specifies Lower Granite, Little Goose, and Monumental dams. For a complete list of possible field names, see [Appendix A](#).

7.2.2 Output File Switches

Determine which of the output files to write: 1 to write, 0 to not write. See the section titled [Output Files](#) for more information on the content of the files.

7.2.3 Directory Configuration

By default, **CaptHist** will search for input files and write output files in the directory where it was run. To change directory for the input or output files, enter the name of the new directory here. This allows the feature of having two subdirectories of the directory that contains the **CaptHist** executable file, one for input and one for output to help keep your files organized. A "." indicates the current working directory.

7.2.4 File Name Configuration

The mortality file and the release file are not necessary for a basic run. These files are used to check errors and to create the travel time output file. By default, **CaptHist** searches the data directory (as configured above) for files of the name all.mrt and all.rel. You can change these default names here. In addition, if you wish to specify the names on the command line with a flag that is possible, too. See the section titled [Command Line Flags](#) for more information.

7.2.5 File Extension Configuration

Set the filename extension for both input and output files. For instance, the SURPH data file could be .SURPH, or on the PC platform .srh since three letters work better there.

7.3 Command Line Flags

Most of the specifics of a run are passed to the **CaptHist** program via command line flags or arguments. These flags tell **CaptHist** what group(s) to look for, where the release was within the system, whether or not to check for errors, and other more esoteric considerations. Below is the entire list of flags along with explanations.

7.3.1 -A: Use Juvenile/Adult Style Capture Histories

When the program is run with the -A flag, the capture history information will be expanded to include flags that differentiate between censored fish and transported fish, and the indication of the year of the adult return. Here are the flags and their meanings:

- 0: Undetected
- 1: Juvenile – Detected and returned to river
- 2: Juvenile – Detected and censored (never to be seen again)
- 3: Juvenile – Transported (possibly seen again as adult)
- A: Adult – Detected the year after release
- B: Adult – Detected the second year after release
- C: Adult – Detected the third year after release
- D: Adult – Detected the four year after release
- E: Adult – Fifth year and older

7.3.2 -c: Allows Single Coil Hits

By default, if a fish is detected at only one coil at a given detection site, this detection record is removed because there is a chance of it being an error. This flag allows you to include these detections if you desire.

7.3.3 -E: Indicates Errors Should Be Found and Removed

Error checking is switched on with this flag

7.3.4 -Freartype:

The rearing type. Same codes as used at PTAGIS.

W -> wild

H -> hatchery

U -> unknown

A -> all

7.3.5 -Ggroup: Where Group is the Obs File and Tag File Prefix

The name of the group of fish to do the run on. If the group is pw1h01, by default **CaptHist** will look for pw1h01.obs and pw1h01.tag for input, and all the output will be prefixed by this group (e.g., pw1h01.srh, etc.). The filename extension can be changed using the "extensions" directives in the chrc file as explained in the section titled Run-Time Configuration. Multiple -G flags may be given.

7.3.6 -l: Include Length in SURPH File, Remove Zero-Length Fish

This flag causes **CaptHist** to add length to the SURPH file as a covariate and, in addition, to remove any fish with a 0 length. Otherwise length is ignored.

7.3.7 -Mmortfile: Gives the Name of the Mortality File to Be Searched For

This file will be searched for in the data directory in place of the default file all.mrt.

7.3.8 **-n: Create New Run Time Configuration File "chrc" with Default Settings**

Create a default chrc for editing and exit.

7.3.9 **-p: Set Output Prefix, Used When Multiple Groups Are Given on Command Line**

When multiple -G flags are given, the output file name prefix is ambiguous. By default the output files will be named composite.*. Use the -p flag to set it to something specific.

7.3.10 **-rrelfile:**

This file will be searched for in the data directory in place of the default file all.rel.

7.3.11 **-RreleaseSite:**

The point of release. This can either be a dam (e.g., gr), or upstream of a dam (e.g., agr). The following are valid release points. By placing the letter "a" in front of any of them, the meaning will be "above" (i.e. upstream of).

agr -> upstream of (above) Lower Granite

gr -> Lower Granite Dam

The release sites need to be at or above one of the sites configured as a main field by the "fields_main" attribute in the chrc file. For instance, if the main fields are configured as follows:

fields_main: gr,go,lm

The accepted release sites are: agr, gr, ago, go, alm, lm.

See [Appendix A](#) for the list of all possible sites.

7.3.12 **-s: Split Input Data to Conserve Memory**

If data files are too big, causing **CaptHist** to run out of memory, this flag can be set to conserve memory. Data files are split into smaller temporary files and then read in one by one; thus, each data file is small enough (hopefully) to be loaded into memory for processing.

7.3.13 -t: Keep Fish Found in the Obs File But Not Found in the Tag File

By default, any fish that is not in the tag file is removed. Use this flag to include these fish.

7.3.14 -Species:

Set the species. By default, this is set to chinook. The species codes are the same as the PTAGIS codes. They are as follows.

- 0 -> all
- 1 -> chinook
- 3 -> steelhead
- 4 -> sockeye

7.3.15 -T: For Traditional, Output SURPH Data in Pre-SURPH2 Format

By default, the SURPH file format is compatible with SURPH.2. To output SURPH data in the old format, use this flag.

7.3.16 -U: Give 3 for Unknown Capture Status

By default, a fish gets a code 2 for its capture history if it is detected and then either known to have been removed or if its passage after the first detection is unknown. If the -U flag is specified, then the second group of fish with unknown fates receive a 3 in their capture history to distinguish them from the first group.

7.3.17 -v: Cause Verbose Status Reporting

Causes status messages to be printed as processing proceeds.

7.4 Examples

Run **CaptHist** on pw1h01.obs and pw1h01.tag, tell **CaptHist** that groups were released above Lower Granite and Dam to check for errors.

```
capthist -Gpw1h01 -Ragr -E
```

Program **CaptHist** will search the data directory (as configured in chrc) for the files pw1h01.obs and pw1h01.tag. If either of these files are not found, then **CaptHist** will exit. In addition, **CaptHist** will search the data directory for a mortality file and a release date file, by default, all.mrt and all.rel. Program **CaptHist** will complete the run whether or not these files are found as the mortality and release date files are optional.

The -Ragr flag tells **CaptHist** to treat the fish as being released above Lower Granite Dam with that being the first detection site. The -E flag causes **CaptHist** to check for errors and to record them in an error log file if any are found. For instance, if a fish is detected above the point of release, that would be an error. This would happen in the following scenario.

If the main fields are configured to be im, gr, go, and lm with the release site being agr, any detection at im would be an error. To include these fish as valid detections, the release site would have to be aim. See the description of the error file above for a more complete description of errors.

7.4.1 Run CaptHist on a Group of Wild Steelhead

Following is the command to run **CaptHist** on a group of wild steelhead:

```
capthist -Gpw3w01 -Ragr -E -S3 -FW
```

With the -E flag, fish of the wrong species are removed. The default species is chinook but with the -S flag with the 3 qualifier, the species has been switched to steelhead. Now with the -E flag, any fish that is not a steelhead is removed. The -F flag with the W qualifier tells **CaptHist** that the fish are wild; by default, the fish are taken to be hatchery fish (H).

7.4.2 Create Runtime Configuration File "chrc" and Exit

Following is the command to create a runtime configuration file and exit:

```
capthist -n
```

This creates the default chrc file which may then be edited for custom configuration.

7.4.3 Run CaptHist in Split Mode: Splitting Input Data to Use Less Memory

Following is the command to split input data to use less memory:

```
capthist -Gpw1h01 -Ragr -E -s
```

This run will have the same results as the first example, but the run will be done in a memory minimizing way so that very large files can be handled. The -s flag tells **CaptHist** to break the input files into smaller files and then to work on each of these smaller files one at a time.

7.4.4 Sorting Fish by PIT Code

Program **CaptHist** splits files so that fish are grouped by PIT code, taking the last n digits as the matching criterion. By default, the fish are sorted by the last digit in their PIT code. This can be modified to create small split files by taking the last two digits of the PIT code by adding a qualifier to the -s flag: -s2.

Appendix A

Site name codes

ab - Abernathy Creek Trap
bv - Bonneville Dam Juvenile
bva - Bonneville Dam Adult
ca - Carlton Acclimation Pond
cc - Catherine Creek Acclimation Pond
cf - Clark Flat Acclimation Pond
ci - Chiwawa Pond
cl - Clearwater River Trap Juvenile
cn - Challis Diversion
dp - Dryden Pond
es - Easton Acclimation Site
gd - Grand Ronde Acclimation Pond
go - Little Goose Dam
gr - Lower Granite Dam Juvenile
gra - Lower Granite Dam Adult
im - Imnaha River Trap
jc - Jack Creek Acclimation
jd - John Day Dam
lm - Lower Monumental Dam
mc - McNary Dam Juvenile
mca - McNary Dam Adult
pr - Prosser Juvenile
rc - Rattlesnake Creek Flat Plates
rf - Refish Lake Creek Trap
ro - Rosa Dam Juvenile
rp - Rapid River Volitional Release
rr - Rocky Reach Dam
sa - Salmon River Trap
si - Similkameen Pond
sn - Snake River Trap
ss - Sunnyside Juvenile
tm - Three Mile Falls Dam Juvenile
tma - Three Mile Falls Dam Adult
tw - Estuary Towed Array Experiment
vc - Valley Creek
wa - Wanapum Dam Juvenile
wea - Wells Adult Ladders
wp - Wapato Diversion Juvenile
ww - Walla Walla South Fork
ya - Yakima River Trap Juvenile